

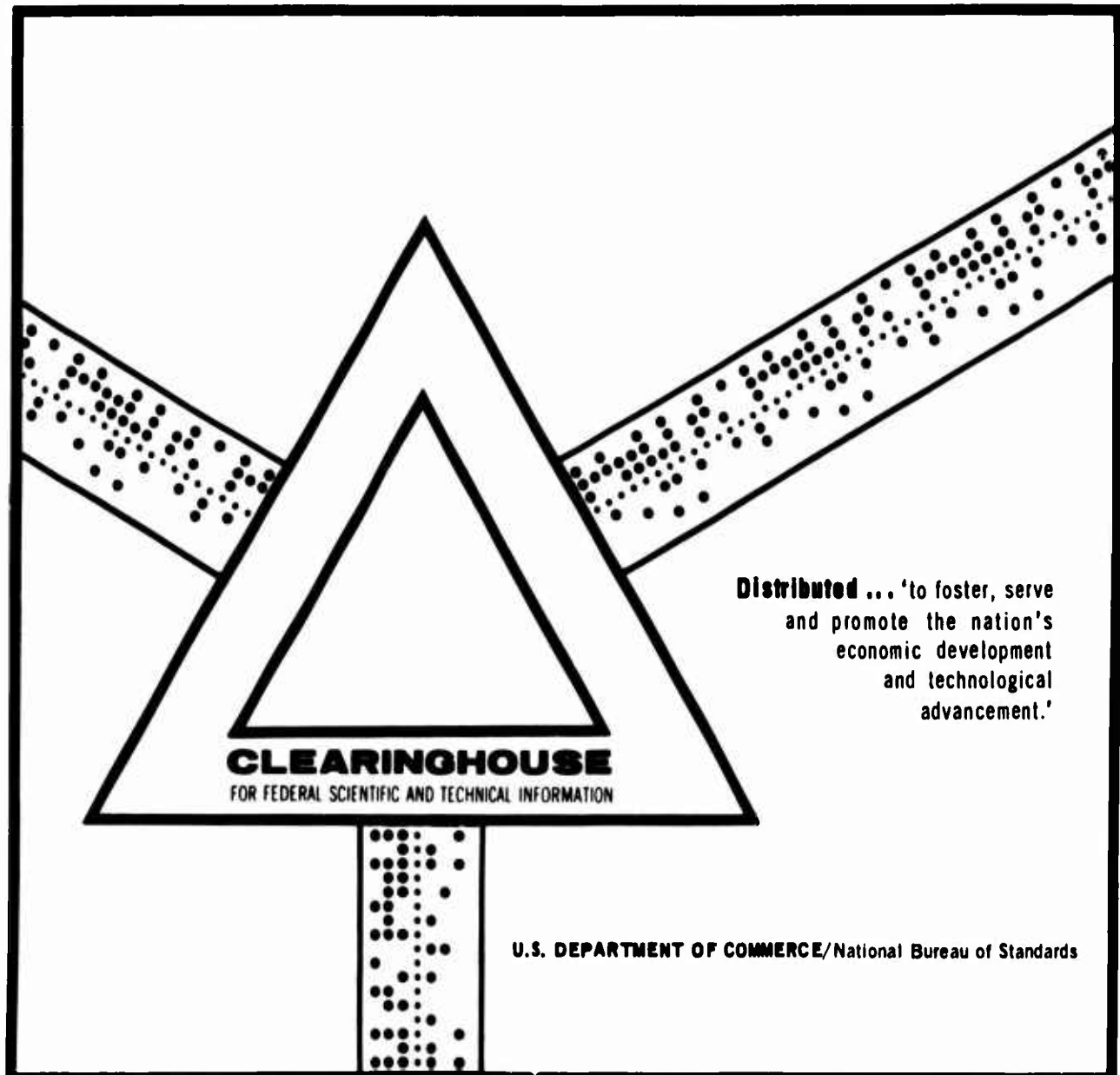
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VELOCITY UNIFORMITY OBTAINED WITH 13 GR.  
MODIFIED M22 PRIMERS IN THE 75 MM GUN

R. H. Kent

Ballistic Research Laboratories  
Aberdeen Proving Ground, Maryland

July 1937



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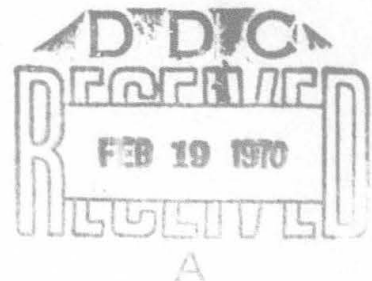
REPORT NO. 81

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by

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U.S. ARMY ABERDEEN RESEARCH AND DEVELOPMENT CENTER  
BALLISTIC RESEARCH LABORATORY  
ABERDEEN PROVING GROUND, MARYLAND

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Aberdeen Proving Ground, Md.

July 19, 1937

VELOCITY UNIFORMITY OBTAINED WITH 13 GR. MODIFIED  
M22 PRIMERS IN THE 75 MM GUN

Project KW 250

Abstract

Twenty rounds were fired with the 13 gr. Modified M22 primers. A mean deviation of 2 f/s or an estimated probable error in velocity of 1.5 f/s was obtained. An explanation of this low dispersion in velocity is tentatively offered.

Authority was obtained to fire a 20 round uniformity series in a 75 mm Gun Mod. 1897 using charges of S.P. FNH, powder lot 3530, ignited with a 13 gr. Modified M22 primer as shown in the attached sketch 2621A.

The results obtained are given in the attached Firing Record No. 9291. From the data given therein the probable error is computed to be 1.45 f/s. This is much smaller than usually obtained in this gun. For example, as shown in Report No. 77, "Probable Errors in Muzzle Velocity of U.S. Army Cannon Revised", the average probable error obtained with the M22 primer and FNH S.P. powder is 3.9 f/s, which is more than twice that obtained in the present test. The number of rounds fired is sufficient to make this result of considerable significance.

While the hang fires were not measured accurately, an approximate estimate may be obtained from the interval from the opening of the Solenoid camera to the first kick. The average value obtained in this way was found to be .306 sec. while the maximum was .492 sec. While hand fires of this duration would be very objectionable in an A.A. gun, it is doubtful whether they would have any materially adverse effect on the firing of a field gun.

To make these results of real value in connection with the design of propelling charges, it is desirable that a theory be devised to account for the very small muzzle velocity dispersion obtained in these firings. In view of the very gentle ignition, there should probably be a complete absence of pressure waves and this absence should tend to produce the small dispersion. On the other hand, the records obtained with the standard M22 primer show that the pressure waves are of exceedingly small amplitude and it is difficult to understand how the reduction of the amplitude of these small waves could produce such a pronounced effect on the velocity uniformity. The following hypothesis is tentatively offered to explain the excellent results obtained.

In this type of ignition, there should be a slow generation of gas which lasts for considerable length of time. Since these cartridge cases were not crimped to the projectile, only a small force would be required to push the projectile out of the cartridge case and seat it on the forcing cone. It is probable that the gas generated during the hang fires would be sufficient to effect this and would thus serve to ram the projectile gently and firmly before the pressure begins to rise rapidly. The results obtained in the 4.7" gun and the 75 mm gun indicate although not conclusively that in these weapons, better uniformity has been obtained with carefully rammed projectiles than with projectiles that are not rammed but are attached to the cartridge case.\* It is therefore believed that the projectiles fired in the present test may have been carefully rammed by the slowly rising gas pressure and that this ramming may have been responsible for the very low muzzle velocity dispersion obtained. To test this hypothesis, a uniformity series should be fired, using the standard M22 primer with projectiles that are carefully rammed before firing.

R. H. Kent

H. H. Zorning  
Lt. Col., Ord. Dept.,  
Chief Research Division

\* Effect of fixing Ammunition on Range and Velocity Dispersion.  
Resume of Results Under O.P. 4034. (10 rd. groups)

Year	Gun	Loading	Range meters	Mean Dev. in Range Meters	Velocity f/s	Mean Dev. in Vel.
1920	75mm 1916 new	fixed	10853	88	1885	8.0*
"	new	unfixed	10828	58	1879	5.2*
"	worn	fixed	9932	183	1784	9.7+
"	worn	unfixed	9952	141	1785	8.0+

\* Velocity and dispersion determined by 5 additional rounds for velocity.

+ Velocity and dispersion determined by 10 additional rounds for velocity

1920	4.7" Gun 1906 new	fixed	11089	156	1781*	13*
"	new	unfixed	11121	79	1792*	11*
"	old	fixed	10267	164	1725	8+
"	old	unfixed	10468	199	1749	8.6+

\* Velocity and dispersion determined by 10 additional rounds for velocity.

+ Dispersion determined by 7 additional rounds for velocity.